Occupational Violence and PTSD-symptoms

A Prospective Study on the Indirect Effects of Violence Through Time Pressure and Non-traumatic Strains in the Occupational Context

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Occupational violence and PTSD- symptoms. A prospective study on the indirect effects of violence through time pressure and non-traumatic strains in the occupational context

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ABSTRACT

Objective: To assess if frequency of occupational violence (OV) affects PTSD symptoms through non- traumatic strains in the occupational context. **Methods:** 12-month prospective survey data on 1763 Social educators was used. Path-analysis measured direct and indirect pathways of frequency of OV on *PTSD* through; *change in time pressure*, *change in burnout*, *change in sense of safety at work*, and *change in coping with regret in patient work*. **Results:** 42 pct. of the variance in PTSD symptoms was predicted; $F(20, 1541) = 36.8$, $p<.001$, $R^2 = .42$. *Frequency of OV* indirectly affected level of PTSD through all the mediators; estimated indirect effects = .14, 95% CI [.07 - .22]. **Conclusion**: PTSD resulting from occupational violence is not only a result of the violent acts themselves. It is essential to include the broader context of work environment factors in prevention of work related PTSD.

Keywords:

Workplace violence, PTSD, Occupational health, work environment.

INTRODUCTION

Occupational violence has received considerable attention in the last few decades. Within the health and service sector occupational violence (OV) is most often perpetrated by the people to whom service is provided[1]. Here OV varies in severity ranging from bites and scratches to armed and life threatening assaults [2,3], and the exposure is often repeated over longer time periods[4,5]. Also OV is a complex phenomenon depending on individual factors; e.g. age[6], years of experience and training of the employees[7] as well as the condition and mental state of the perpetrator[8]. OV is related to organizational factors; basic work demands[9], role-clarity and role-conflict[10] as well as leadership quality and social support[10–12]. While extant research on OV has primarily concentrated on these antecedents and risk factors [13–15], fewer studies have revolved around the negative health impact of the violent episodes[1,16,17]. Research has largely focused on the association between OV and posttraumatic stress disorder (PTSD). Prospective studies show that exposure to OV increases risk of PTSD[18–20]. Further, extant literature has indicated that the frequency of OV might be a predictor of general mental health problems also, PTSD [21–23]. While the association between OV and PTSD seems well established, little is known on the actual causal mechanisms linking OV with PTSD. Recent recommendations both in relation to trauma reactions[24] and OV [25,26] have underlined the need for systemic approaches, that include multiple factors, both individual and contextual, to better understand how OV might lead to PTSD. Studies are needed that analyze the more complex associations of OV and PTSD in relation to factors relevant for the occupational context.

PTSD IN THE OCCUPATIONAL SETTING

According to the World Health Organization, PTSD is defined as a protracted or delayed reaction to an exceptional threatening event causing symptoms of; re-living the trauma,

avoidance of stimuli that reminds of the trauma, and autonomic hyperarousal[27]. The PTSD diagnosis must be preceded by single life-threatening or catastrophic events i.e. violent assault, accidents, and sudden bereavement, or prolonged exposure to stressors such as war, childhood abuse or torture. While some of these critical incidents might occur in any occupational setting[28], there is reason to believe, that work-related PTSD might generally develop differently compared to civilian life. Research on the development of PTSD shows that PTSD is not only dependent on severe stressors, but also on other etiologic factors both pre-, peri-, and post- critical incidents[29]. In the occupational context studies on PTSD are often conducted in occupations where rates of critical incidents are high compared to civilian life[30] and employees are often repeatedly exposed to these incidents. This is also true in occupations with high risk of violence, where employees are often exposed to repeated incidents of violence for longer periods in time[3,31].

McFarlane[30] has argued for a theoretical framework of sensitization to understand work related PTSD as a reaction to cumulated strain. Here repeated exposure to similar critical events such as OV is meant to cause central sensitization. Repeated exposure to critical incidents, thus results in a gradual lowering of reaction threshold in the exposed individual, while at the same time amplifying the individuals response each time of re-exposure[32]. In this perspective, repeated incidents of OV would result in a gradual vulnerability to violence, possibly increasing reactions with PTSD symptoms after each event, even though these may be less severe. Another framework of understanding work related PTSD is within theories of delayed onset PTSD. A review and meta-analysis conducted by Utzon-Frank and colleagues (2014)[33] shows that delayed onset PTSD is significantly more prevalent in professionals with PTSD compared to PTSD among civilians[33]. In most high-risk occupations, employees are trained to handle the critical incidents specific to their work. It is thought that this training may act as a buffer to the traumatic impact of these incidents[34,35], partly because the

professional is able to repress their reactions to adequately continue their work[35]. But, even though reactions are repressed during an event, they can linger as dormant symptoms for prolonged periods of time, causing an allostatic load[35,36]. This allostatic load wears down the individual's resources. It has been proposed, that in case of latent symptomatology, future critical incidents as well as general stressors, can trigger the symptoms anew causing sub-clinical or full PTSD later in time[36].

In both of the theoretical frameworks, i.e., sensitization and delayed onset PTSD, we would expect a longer prodromal phase of PTSD, with initial low-level symptoms, gradually increasing in relation to re-exposure to OV. Further, due to the inherent understanding of the gradual weakening of a threshold or barrier for reacting with PTSD, both models include an understanding where general stressors could contribute to PTSD symptomatology, because they reduce individual resources[30,36].

Understanding work related PTSD caused by repeated exposure to OV, thus necessitates a focus on development of low level and sub-syndromal symptomatology as possible indicators of prodromal states of later PTSD. Also, investigating the development of PTSD following OV should include other relevant stressors in the occupational context. PTSD might be a result of the cumulated strain of several stressors in conjunction with a critical event such as OV. It is therefore important to also assess how OV might impact on general work strain and the individual perceptions of the work environment, because they could be central to how and if OV might lead to development of PTSD symptoms [37].

TIME PRESSURE

A stressor that might be affected by the frequency of OV is time pressure. Time pressure is a core work-environment factor that seems to be increasing within the European workforce[38]. In the health and service sector, time pressure, leading to a high work tempo, difficulty

meeting deadlines, and frequent shifts between patient-/client-related decisions and job tasks, is considered a critical work environment issue[39].

OV and time-pressure have been positively associated in cross sectional studies[40,41]. Here, time pressure is thought to affect the risk of OV by causing negligence towards safety procedures, such as knowledge sharing during work-shifts or refraining from use of proper assisting devices in close care situations. But, OV could probably also increase time pressure. Working with an aggressive patient, or handling a violent incident in care situations is in itself time consuming, thus reducing the overall time schedule for handling the daily chores. Also, the impact of OV on the employee might reduce the work efficiency for some time after the incident. This would increase time pressure for the remains of the day since each of the following work task would take longer time, compared to the workflow when OV is not occurring. No studies have been identified that actually investigates whether OV might increase time pressure. However, OV have been associated with reduced productivity at work[42] indicating that OV affects later work process. Also, the fact that existing evidence on the association of OV and time pressure is cross sectional, opens for the interpretation of reverse or bi-directional associations between these two phenomena.

According to the framework of work- related PTSD presented above, time pressure could partly be a consequence of OV contributing to an overall strain that reduces individual resources and indirectly increasing risk of PTSD following exposure to violent incidents.

But time pressure may also affect PTSD in another way. Time pressure has been associated with mental health problems such as burnout, depression and general stress[43–45]. This indicates that time pressure might be a contributing factor to some shared elements of common mental health disorders often presented in co-morbidity with PTSD[46]. While time

pressure has not previously been studied in relation to PTSD, it seems prudent to focus on this basic work environment factor, when trying to understand how OV can cause development of PTSD.

BURNOUT

Burnout was originally conceptualized as emotional exhaustion, cynicism and reduced work competence, relevant in human workers[47]. In recent years, burnout has also been understood in a more generic term as a reaction to long term emotional strain of different stressors across all workgroups, primarily through the core symptoms of mental exhaustion[48]. Both time pressure[49] and OV[50] are associated with burnout just as burnout has been associated with PTSD[51]. Based on a study on OV in correctional officers, Boudoukha and colleagues (2017) hypothesized that burnout, as a result of both general stressors and relational strain caused by OV, would increase mental health problems and potentiate traumatic responses to violent incidents[51]. This understanding is in line with both sensitization and allostatic load theories. Burnout can be understood as an expression of a more lasting state of stress that increases the cumulated strain on the individual that might cause PTSD- symptoms to emerge as a reaction to OV.

Further, it has been established that chronic stress and burnout[52,53] are conditions involving dysregulation and hyper activity of the Hypothalamic–Pituitary-Adrenal(HPA) axis[54]. These same neurophysiological processes are present in PTSD[55]. It seems logical to consider a possible shared etiologic pathway in burnout and development of PTSD symptoms as a result of both the impact of frequent exposure to OV and as a result of the general strain of time pressure.

SENSE OF SAFETY AT WORK

The association between OV time pressure and sense of safety at work might prove central in the understanding of how OV can affect the development of PTSD. Sense of safety at work is central when investigating occupational violence. The sense of fear or lack of safety are reactions often reported after patient assault[1]. It is regarded as pivotal in the understanding of how OV affects employees` wellbeing [56,57]. Sense of safety at work has been associated with both reduced fear reactions and reduced psychological distress following OV[58]. In relation to PTSD, sense of safety is relevant, due to the central fear component of the PTSD syndrome and studies have shown that a lack of perceived safety is associated with PTSD symptoms[59–61].

Time pressure following OV might also affect sense of safety at work. Studies on workplace safety environment have repeatedly proposed that time pressure or workload affects the employee's safety motivation thus causing negligence to safety procedures and adhering to safety policies[62,63].Time pressure could therefore result in negligence to safety procedures causing the employee to act in ways that makes him or her insecure in relation to handling aggressive patients. Time pressure could also cause a longer response-time in relation to distress calls and increase the general experience of not being able to receive sufficient help in these dire situations. Indeed, time pressure has been associated with the risk of work-place accidents[64] as well as with reduced patient and employee safety[39,65,66]. Time pressure could be important for the association between OV and PTSD.

REGRET COPING

Based on existing knowledge, it also seems relevant to investigate if frequency of OV and time pressure might affect regret coping and its association with PTSD symptoms. Regret,

defined as a psychological reaction after a decision or action that has unwanted or negative effects[67], is often reported in relation to patient work within the health and service sector. It has been associated with negative consequences on employee well-being[68–70]. OV can be seen as an unwanted result of caretaker-patient interaction[3,71], where the employee may regret his or her behavior prior to, during, or after the violent episode. Qualitative studies support this perspective, and have shown that caretakers` emotional reactions, following patient initiated violence, are often characterized by self-blame, guilt, and shame [72]. The feeling of regret is a common emotion[73]. But, the way one copes with regret, can be a key factor to whether and how strongly, regret has a negative or positive emotional impact[74,75]. Until now, no studies have focused on regret coping in relation to PTSD. But, rumination and self-agency have both been linked to the development of PTSD symptoms[76] and are both elements in regret coping[77]. Also, high work demands, including time pressure, have been associated with an increase in emotional ruminative coping styles[78]. This indicates that some aspects of coping with regret after OV might be influenced by time pressure and could impact expression of PTSD symptoms.

AIM

While traditional work environment problems, e.g. dust, noise, chemicals, are well managed in many European countries, OV seems to be a persistent problem within the human service work in modern societies. This type of exposure have repeatedly been associated with the development of PTSD, but there is a lack of the understanding of how OV might cause this development within the complex interaction of the employee and the occupational context. Enhancing this understanding could prove central to the improvement of both secondary and tertiary prevention.

The current study investigates if frequency of violence is prospectively associated with PTSD symptoms, through its influence on change in time pressure, change in burnout symptoms, change in perceived sense of safety at work, and change in regret coping in patient work. Based on the framework presented above we propose the following specific hypotheses (depicted as pathways in Figure 1):

Hypothesis 1 (H1): *Frequency of OV* is positively associated with c*hange in time pressure* between baseline and follow-up, which is positively associated with *PTSD symptoms* at follow up.

Hypothesis 2 (H2): *Frequency of OV* is positively associated with a *change in burnout symptoms* from baseline to follow-up, which is positively associated with *PTSD symptoms* at follow-up.

Hypothesis 3 (H3): *Frequency of OV* is inversely associated with a *change in sense of safety at work* between baseline and follow-up which is inversely associated with *PTSD symptoms* at follow-up.

Hypothesis 4 (H4a): *Frequency of OV* is positively associated with a *change in maladaptive emotional regret coping* between baseline and follow-up which is positively associated with *PTSD symptoms* at follow-up. (H4b): *Frequency of OV* is inversely associated with a *change in problem solving regret coping* between baseline and follow-up which is inversely associated with *PTSD symptoms* at follow–up. (H4c): *Frequency of OV* is inversely associated with a *change in distancing emotional regret coping* between baseline and follow-up that is inversely associated with *PTSD-symptoms* at follow-up.

We further propose a hypothesis regarding double-mediated effects from *Frequency of OV* through *time pressure* unto the other predictors. Here we expected that:

Hypothesis 5 (H5): *Frequency of OV* at baseline is positively associated with c*hange in time pressure* between baseline and follow-up, that is positively associated with *change in burnout symptoms* between baseline and follow-up which is positively associated with *PTSD symptoms* at follow-up.

Hypothesis 6 (H6): *Frequency of OV* is positively associated with c*hange in time pressure* between baseline and follow-up, which is inversely associated with a *change in sense of safety at work* between baseline and follow-up which is inversely associated with *PTSD symptoms* at follow-up.

Hypothesis 7 (H7a): *Frequency of OV* at baseline is positively associated with c*hange in time pressure* between baseline and follow-up, which is positively associated with *change in maladaptive emotional regret coping* between baseline and follow-up which is positively associated with *PTSD symptoms* at follow-up. (H7b): *Frequency of OV* is positively associated with c*hange in time pressure* between baseline and follow-up, that is inversely associated with *change in problem solving coping* between baseline and follow-up, which is inversely associated with *PTSD symptoms* at follow-up. (H7c): *Frequency of OV* is positively associated with c*hange in time pressure* between baseline and follow-up, that is inversely associated with a *change in distancing emotional regret coping* between baseline and follow-up, which is inversely associated with *PTSD symptoms* at follow-up.

Hypothesis 8 (H8): Frequency of OV is directly and positively associated with *PTSD-symptoms* at follow-up.

METHOD

SAMPLE AND PROCEDURES

The study was based on the "everyday violence" cohort, a prospective cohort of 1,763 social educators working with disabled adults. Data was collected from 2016 to 2017. As depicted in Figure 2, we used a baseline (T_1) and 12-month follow-up (T_2) survey, measuring PTSD, burnout, demographic and lifestyle factors, strain in the psychosocial work environment, lifetime critical incidents and critical incidents outside of work as well as coping strategies relevant to regret in patient work and coping with potential traumatic events. We also used 12 monthly (M_{1-12}) short surveys to measure actual exposure to OV within the study period.

We invited 12,070 social educators and among the 3,212 who wanted to participate, we excluded those who were in a leadership position (N=297), who did not have Danish as their native language (N=141) or who were unemployed at baseline (N=20). Of the 2754 eligible at baseline, 2172 (78.8%) answered the follow-up questionnaire. Another 133 respondents were excluded based on the exclusion criteria and 211 respondents were excluded because they had answered less than 6 of the 12 monthly short surveys. We further deleted all who had clinical levels of PTSD at baseline (N=65), rendering a prospective cohort of 1,763 respondents.

MEASURES

Outcome

The outcome was *PTSD symptoms* at follow-up (T_2) measured with the new ICD 11 scale (ITQ)[79], shown to have good construct and criterion validity in earlier studies[79,80]. The scale consists of a total of 6 items, 2 items for each of the three symptom clusters of PTSD; re-experiencing (e.g. *powerful images or memories that sometimes come into your mind in which you feel the event is happening again*), avoidance (e.g. *avoiding internal reminders of*

the stressful experience) and hypervigilance (e.g. *being super alert, watchful or on guard*). Each item was answered on a five point Likert-scale with 0 = never and 4 = always. The scale had good to acceptable internal consistency for each subscale with Cronbach`s alpha = .68 (re-experience), .85 (avoidance) and .80 (hypervigilance). For the full scale, Cronbach`s Alpha = .87.

Predictor

Frequency of OV during all 12 months (M_{1-12}) was the main predictor. OV was defined as incidents of physical violence and threats of violence [57], perpetrated by clients and their relatives. We used 4 items adapted from a checklist used in other Scandinavian studies [3,81,82]. The adapted items were piloted on a small population of social educators and where then used as the monthly measures of exposure to violence including; 1; *threats of physical violence,* 2; v*iolence such as scratching, biting, pinching or hitting with flat hands etc.,* 3. *kicking or punching with fists to the head or upper body* and 4. *severe assault or attack with weapon or weapon-like object.* Response categories were 0 = *No violence,* 1= *1-3 incidents last month,* 2 = *4-6 incidents last month,* 3= *more than 6 incidents last month.* We summed up all the answers and divided them by the number of response months, thereby obtaining a proxy measure of the average monthly *frequency of OV*

Mediators

Change in Time pressure was the first mediator placed in serial relation to *frequency of OV* as depicted in Fig. 1. It was calculated by subtracting the baseline value from the follow-up value (T_2-T_1). Time pressure was measured with the *work tempo* scale from the Copenhagen Psychosocial Questionnaire (COPSOQ)[83]. COPSOQ is a validated questionnaire on general factors of the psycho-social work environment[84–87]. The scale consists of 3 items regarding

experience of the daily work tempo (e.g. *is the work tempo high throughout the whole work day*) answered on a 5 point Likert scale, with 0 = *never/almost never* and 4 = *always/almost always*, averaged and normalized to a 0-100 scale and treated as a continuous variable according to the manual[88]. Internal consistency was good in the present study with Cronbach`s alpha = .78.

Change in Burnout symptoms, change in sense of safety at work, and *change in regret coping* were the 2nd., 3rd., and 4th. Mediators measured in parallel. All three were calculated by subtracting the baseline value from the follow-up value, i.e. $T_2 - T_1$,thus obtaining a measure of the development within these two time points.

Change in burnout was measured using the personal burnout scale from the Copenhagen Burnout Inventory (CBI)[47]. CBI is a validated measure on the generic concept of burnout[47]. The scale consists of 6 items (e.g. *How often do you feel worn out?*) answered on Likert scales from 0=*never* to 4=*always,* averaged and normalized into a 0-100 scale as instructed in the manual. The scale had good internal consistency with Cronbach`s alpha =.87. We were concerned that development of PTSD and burnout might be overlapping, measuring development of a more general mental health problem. We therefore ran principal component analysis using maximum likelihood estimation with oblique rotation and repression of values less than 0.3, to assess the constructs measured. We found a clear two factor model of PTSD and Burnout (results not shown).

Change in sense of safety at work were measured using 2 items from studies done on violence and safety-behavior in Danish workplaces[89]; "*In general, safety at my workplace is satisfactory*" and "*I feel safe when I move about in my workplace".* Both answered on a 5

point Likert scale 0 = *totally disagree* to 4 = *totally agree,* averaged and treated as a continuous variable. Cronbach`s alpha was good = .81

Change in Coping with Regret, was measured with the Regret Coping Scale for Health Care Professionals (RCS-HCP) a newly developed scale validated in several languages[77,90,91]. The scale measures coping with regret in patient work within the occupational context, focusing on *problem solving coping* (i.e. *I discuss the incident with my leader to prevent it occurring again*), *Distancing* e*motional coping* (i.e. *I tell myself to err is human*) and *Maladaptive emotional coping* (i.e. *I think so much about the incident that it becomes disruptive*). We used the adjusted 10 item scale based on the Danish validation study[91]. Each scale consists of 3-4 items answered on 4 point Likert scales, 0= *Never/almost never* and 3 = *Always,* averaged and treated as continuous variables. Cronbach`s Alpha was acceptable to good for each scale considering the few items[92]; *problem-solving coping* = .70, *Distancing emotional coping*= .65 and *maladaptive emotional coping* = .84. Since Coping with Regret involves parallel processes, individuals are expected to use all three coping strategies to different extents. No summed measure of regret coping was therefore used.

Co-variates

We wanted to investigate possible causal mechanisms leading to development of PTSD-symptoms and therefore included a wide range of possible confounders that could affect the outcome of PTSD, or the mediating variables included in the model. Co-variates were chosen based on the existing research referred to in each variable mentioned.

We included the following demographic and lifestyle measures; *age* (whole years) and *gender* (male/female)[93] *alcohol consumption* (daily no. of drinks)[94] *Body mass index* (BMI -

weight /height^2)[95] and *smoking* (yes/no)[96]. We also included variables relevant for developing PTSD; *Lifetime Critical incidents* and *critical incidents within the study period*[97] measured with the Lifetime Critical Incident scale from the national co-morbidity survey[98]. *Training in handling violence* [99] in present or past occupations was included as a binary variable (yes/no). *Trauma coping self-efficacy*[100] was measured using the validated 9 item instrument, T-CSE [100] treated as a sum scale, indicating individual robustness in handling critical incidents. We also included a measure of incidents of exposure to the most severe cases of OV since these incidents meet the requirements of the A-criteria of the PTSD diagnosis[27]. Here we summed up all responses of the item measuring severe incidents of violence, transforming it to a dichotomous item; *incident of severe violence* (yes/no).

We included workplace factors associated with mental health problems i.e.; *Experience*[101] (measured as years working as a social educator). We included *General work demands* (quantitative and emotional)[40,102], *role- conflict* and *role-clarity*[103] all measured with COPSOQ. We included workplace social capital between coworkers *bonding social capital* and between leader and co-worker *Linking social capital* as a measure of group cohesion, trust and fairness within the workplace[104–106]. Workplace social capital was measured using the validated Danish Workplace social capital survey[107]. We further included baseline values of all mediator variables and the outcome variable.

STATISTICAL ANALYSIS

Sample assessment

To assess sampling bias, the baseline sample was compared to the non-respondents on *age, gender* and *area of work*. Only *age* differed significantly between the two groups, with mean age 47.9 years (SD= 9.9 years) in the baseline sample and 46.5 years (SD= 10.7 years) in the

non-respondent group. We secondly completed attrition analysis using binary logistic regression with outcome *dropout/no-dropout*, and predictors; *age, gender*, *lifetime traumatic events*, *threats and violence the year prior to the study period*, *experience* and *PTSD-symptoms at baseline*. *Age* and *PTSD-symptoms* at baseline significantly predicted attrition and were kept as possible confounders in all models.

Data assessment

Missing data amounted to 2.6 % distributed on 23.6 % of the respondents. Pairwise deletion was used in the analysis. Distribution of all variables showed acceptable degrees of normality except for the outcome of *PTSD-symptoms* which was heavily right-skewed. This was "corrected" by the bootstrap re-sampling procedure used in the main analysis[108]. Data showed no indication of multicollinearity (VIF between 1.1 and 2.1) and no indication of serial autocorrelation; Durbin Watson = 1.94. There was indication of single influential cases. Cooks distance < .032, were not indicating a problem. But, we found 22 cases with Mahalanobis-distance(24 predictors) > the critical value of 48.28, $p<.01$. These cases were evaluated manually, but not seen as outliers, and were kept in the analysis where we ran sensitivity analyses deleting these cases but found no overall changes in results.

Main analysis

Since the inclusion of a wide range of confounders increases risk of overfitting the model we ran initial simple regression analysis to assess each of the confounders. Here we ran simple models with predictor variables; frequency of OV, gender, age and PTSD at baseline using PTSD at follow-up as outcome. We then entered each of the confounders separately, assessing how they influenced the association between frequency of OV and the outcome. Confounders that significantly changed the association between *frequency of OV* and *PTSD*

at follow-up with 5 % or more, were included in further modelling to control for aggregate confounding.

The path-model was built in regards to the hypothesis H1 to H8 depicted conceptually in Figure.1. *Frequency of OV* was the main predictor, followed by *change in time pressure* as the first serial mediator. We then entered three parallel mediators; *change in burnout symptoms*, *change in sense of safety at work,* and *change in regret coping.* Output was *PTSD symptoms* at follow-up. We conducted the path model stepwise gradually including more confounders using a crude model 1; adjusting for gender, age, and baseline level of PTSD symptoms. Then running model 2; also adjusting for baseline values of all of the mediators and finally running model 3; further adjusted for significant confounders. Both outcome and all mediator variables were adjusted for co-variates. Regressions of the path analysis was done in one full model with SPSS version 24 using the Process macro 3.0 model 81 with 10.000 bootstrap re-samples and the Huber White correction for heteroscedasticity[109]. The simple effects of each path were calculated as well as the indirect effects of frequency of OV on PTSD, both overall and through each of the model pathways (H1-H8). Due to the re-sampling technique, it was possible to get an estimate of the effect size, based on the sample distribution, calculating 95 % confidence intervals. Using this method, estimates of indirect pathways are significant when confidence intervals do not cross zero, with a significance level corresponding to the general level of acceptance $p<.05$[109]. Results were presented as simple effects, i.e unstandardized betas (β) and fully standardized direct and indirect effects.

RESULTS

Descriptive statistics and basic correlations of the main variables are shown in Table 1 and basic descriptive statistics for all co-variates are shown in Table 2. Most of the respondents

were women, 78.5 % and 21.5 % were men. The sample mean age was 48.7(SD=9.4) years, with mean work experience of 17.3 years. The mean of *PTSD symptoms* at follow-up were generally low with a mean of 2.56 (SD=3.56). Frequency of OV was relatively high with a mean of 0.78, (SD=0.98). Mean *Time pressure* at baseline was 53.0 (SD=17.5). This was close to the mean of 57.0 from a randomized sample of health and service personnel, from the 2005 Danish national workers cohort [110]. In general, *change in burnout*, *change in perceived sense of safety at work* and *change in regret coping* were small, indicating factors that were only slowly progressing.

As depicted in Table 3 the model significantly predicted PTSD at follow-up with substantial variance explained across all levels of adjustment. The full model significantly explained about 42% of the variance in *PTSD symptoms* at follow-up; F (20, 1541) = 36.8, p<.001, R^2=.42.

Simple effects within the model-paths, for the fully adjusted model are shown in Figure 3. *Frequency of OV* predicted *change in time pressure;* β = .92. t (19) = 2.4, p=.012. Both *Frequency of OV* and *change in time pressure* predicted the two parallel mediators *change in burnout*; $\beta_{(Frequency\ of\ OV)}$ = .07, t (18) = 2.4, p<.014, $\beta_{(change\ in\ time\ pressure)}$ = .01, t (18) = 7.3, p = .001, and *change in sense of safety at work*; $\beta_{(Frequency\ of\ OV)}$ = -.11, t (18) = -4.2, p<.001. and $\beta_{(change\ in\ time\ pressure)}$ = -.07, t (18) = -4.1, p <.001. Only *time pressure* predicted a *change in maladaptive emotional regret coping;* $\beta_{(time\ pressure)}$ = .01, t (18) = 2.2, p=.03. Neither *frequency of OV* or *change in time pressure* was significantly associated with *change in problem solving regret coping* nor c*hange in distancing emotional regret coping*.

The total effect of *frequency of OV* on PTSD was; β = .46 t (19) = 5.0, p <.001. Here the direct effect was β = .32 t (15) = 3.8, p <.001. Table 4 shows the effects of the different

indirect pathways, for the different levels of adjusted models, each presented in relation to the original hypotheses H1-H7. In the fully adjusted model, *frequency of OV* had no significant indirect effect on *PTSD* through *change in time pressure*; (rejection of H1) estimated effect = .00, bootstrapped 95 %CI [.-012 -.012]. However, *frequency of OV had significant but small indirect effect on PTSD through change in burnout* (confirmation of H2); estimated effect = .050, bootstrapped 95% CI [.001 -.100], *change in sense of safety at work* (confirmation of H3); estimated effect = .045, bootstrapped 95% CI [.018 -.080], but not through any *change in regret coping* (rejection of H4a-c).

Further, *frequency of OV* had significant indirect effects *on PTSD* through the doubled mediated pathways of both *change in time pressure and each of the* three parallel mediators. *Frequency of OV - change in time pressure –change in Burnout-PTSD* (confirmation of H5)*;* estimated effect = .010, bootstrapped 95% CI [.002 -.020]. *Frequency of OV - change in time pressure –change in Sense of Safety at work-PTSD* (confirmation of H6): estimated effect = .003, bootstrapped 95% CI [.000 -.007]. *Frequency of OV - change in time pressure –change Regret coping emotional maladaptive – PTSD*(confirmation of H7A); estimated effect = .002, bootstrapped 95% CI [.000 -.005]. Frequency of violence had no significant double mediated effect through neither *regret coping distancing* or *regret coping problem solving* (rejection of H7B,C).

DISCUSSION

This study is one of few studies to assess how frequency of OV is prospectively associated with PTSD in relation to basic factors of the employee and the work environment. As expected, we found that frequency of violence did have a direct effect on PTSD(confirmation of H8) which is consistent with the definition of PTSD as a reaction to severely and threatening events[27]. We also found that frequency of violence was indirectly associated with

PTSD symptoms through its effect on *change in burnout symptoms, change in sense of safety at work*, and *change in maladaptive regret coping* (confirmation of hypothesis H2, H3 and H4a). Further, we found that while change in time pressure following OV did not significantly affect PTSD, it indirectly affected PTSD through these same mediating factors *change in burnout symptoms, change in sense of safety at work*, and *change in maladaptive regret coping* (confirmation of hypothesis H5, H6, H7A).This indicates that OV causes changes in core work environment factors, that creates a strain on the individual that is associated with subsequent levels of PTSD. No studies have been identified, that investigates the complex association of frequencies of OV and PTSD through these other work related factors. It is therefore not possible to compare our overall findings with existing evidence.

However, our findings that frequency of OV was positively associated with PTSD symptoms have been shown in other cross sectional studies regarding emergency nurses[21] and mental health care professionals[111,112]. Only two studies have examined the prospective association of frequency of OV and PTSD. Andersen et. al (2018)[113] found that across 2678 human service workers of different occupations there were no significant associations between frequency of OV and probable PTSD 4 years later. In a previous study conducted by this author group on the present sample of social educators, we found a significant and clear exposure response pattern of frequency of OV and clinical relevant PTSD symptomatology within a 12 month period[23]. It is difficult to compare studies across different populations and different measures, but we believe that differences in the prospective findings could be due to the very different measurement periods and the fluctuating nature of PTSD[114]. Within studies of a shorter timeframe, the extant literature supports our present findings[21,23,111,112]. Our results are also in accordance with the theoretical framework proposed by McFarlane and colleagues, that states that PTSD can develop as a result of sensitization due to the cumulated

strain from repeated critical incidents[30]. This is important in relation to the working environment, because repeated "small" incidents occur frequently.

The positive association seen between frequency of violence and change in time pressure is in accordance with the cross sectional associations seen in other empirical studies[40,115]. Shea et. al. (2017) found that for 4981 health care professionals, high workload significantly increased risk of violence (OR = 1.4). In Denmark similar results were produced by Agervold & Andersen (2006) who found a positive correlation between work pressure and OV (Kendalls Tau b = .018) in a cross sectional sample of 228 employees working at institutions for the mentally disabled. Our prospective findings of the association of frequency of OV and change in time pressure is not in contradiction to these finds but proposes the possibility of an inverse or reciprocal relationship between OV and time pressure an association that needs to be further confirmed in future prospective studies.

Frequency of OV affected *PTSD symptoms* through its association with *change in burnout, change in security at work* and *change in maladaptive emotional regret coping.* This indicates that *frequency of OV* is also a contributing factor to other pathways of strain leading to higher levels of PTSD symptoms. The doubled mediated pathways leading from *frequency of violence through time pressure and the three parallel mediators* underlines this understanding of time pressure as a secondary strain related to OV and subsequent PTSD. These findings are in accordance with the theoretical understanding of PTSD symptoms as affected by non-traumatizing stressors that reduces individual resources causing the expression of PTSD symptoms as reactions to OV. This same process is also indicated in the cross sectional study by Boudoukha and colleagues[51].

Although c*hange in problem solving regret coping* was negatively associated with PTSD, we did not find any significant association between *change in distancing emotional regret coping* or *change in problem solving regret coping* with either *frequency of OV* or *time pressure*. We cannot explain why these coping strategies were not affected, as opposed to the *maladaptive emotional regret coping*. A possible explanation could be that these coping strategies may involve other factors in the work environment such as social networks or policies for openly handling mistakes in patient-/client- work. It could also be that *maladaptive emotional regret coping* might be affected by a change in mental health. Here rumination might be a symptom of mental health problems, thus enhancing this specific type of regret coping. This could especially be the case in relation to PTSD where the symptom cluster of re-experience actually contains intrusive and pressing thoughts on the traumatic event[27]. Discerning this maladaptive coping from actual mental health symptoms thus proves difficult, and should be investigated in future research.

STRENGHTS, LIMITATIONS AND IMPLICATION FOR FUTURE RESEARCH

The study profits from its prospective design, using the change in predictor variables between two time points to assess mediating processes. Also, frequent measures of OV secure an accurate estimation of actual exposure to violence, just as the study includes a very wide range of known confounders, building on validated measures.

The study has limitations. Our data indicate that changes measured in the parallel mediators are phenomena that are only slowly progressing, which is in accordance with theory on burnout[48], coping mechanisms in adults[116] and work environment[117]. The fact that our mediated effect sizes are generally small, could be an effect of these small changes, but allows scope for doubt as to whether our findings have any clinical relevance. As such, our

results should be considered preliminary and future studies should investigate changes over longer time periods of several years.

Also, due to the two-wave design, we were not able to detect the actual sequence of the mediators. While the mediating variables approximate actual change taking place between measurement at baseline and follow-up, the sequence of events concerning the predictor and the serial and parallel mediators could only be argued theoretically. Future studies using at least 3 time points, or several repeated measures, could empirically assess the proposed sequence of mediation.

Common method bias is a concern in our data. The use of survey based data implicates a risk of measuring a general response tendency within the individual. However, factors of the psychosocial work environment are both extra- and intra psychic phenomena, and use of survey based items are thus theoretically meaningful[118]. Also, the use of validated scales reduces the risk of common method bias to some degree[119]. We acknowledge that future studies could profit by including a mix of objective measures (i.e. clinical or health registers) with survey and in-depth qualitative data, which could validate our proposed hypothesis about causal mechanism regarding OV and PTSD.

Our attrition analysis indicated a risk of sampling bias as PTSD and young age both predicted dropout which could mean that our sample was affected by a healthy worker selection. Our results should be interpreted with this in mind, rendering it possible that the indirect effects of time pressure on PTSD symptoms could be more pronounced in the population of social educators, compared to what was found in the study sample.

Finally, our model is complex including a high number of parameters which increases the risk of overfitting. Our results could express the random errors of the sample rather than actual and general existing associations. But, we worked with a large sample size with well over 15 observations for the summed-up number of parameters which reduces risk of overfitting the model. Also, we calculated the predicted R^2 based on the predicted residual error sum of squares. Here we found a high similarity between the actual R^2 = .42 and predicted R^2 =.44 which strongly indicates that overfitting was not a major concern in our model. We do, however, acknowledge the need for future studies applying similar models to other samples in order to assess the general explanatory value of our model.

PRACTICAL IMPLICATIONS

We believe our study has several practical implications for the prevention of PTSD resulting from OV. Time pressure should be considered as a possible etiologic factor for the development of PTSD symptoms following acts of violence. Preventive initiatives that ensure a steady non-paced work tempo as a basic working condition in work settings where OV is a risk, could reduce the risk of PTSD. However, we acknowledge that calculating the economic consequences of PTSD and other related diseases are probably necessary to convince the employers to reduce work tempo.

In earlier work, we have argued for the necessity of including monitoring the frequency of violence for detecting the risk of PTSD[23]. The present results suggest that monitoring burnout could also improve prediction, since burnout seems to be an aggravating factor for PTSD. Even small developments in burnout should result in prevention measures such as rotation or replacement from departments of patients causing high frequency of OV. This could reduce not only the detrimental effects of burnout but also risk of PTSD.

We found that a change in the perceived sense of safety at work was associated with PTSD-symptoms following OV but was also influenced by time pressure. This indicates that leadership and occupational health-professionals should ensure that time pressure does not result in negligence towards safety behaviors. Provided that sufficient safety procedures are present, following-up on employees after violent incidents would probably benefit from a review of safety procedures. This should not be to detect mistakes or to place blame, but to restore and enhance the employee's objective perception of existing safety measures, to bolster a sense of safety and future control, which is essential in preventing traumatization[120].

Maladaptive coping was positively associated with PTSD. Also, OV indirectly affected regret coping through time pressure by increasing the use of maladaptive emotional regret coping. Therefore, establishing procedures that can disrupt the ruminative pattern of maladaptive emotional regret coping seems prudent. Education in different regret coping strategies and training in emotion regulation techniques could be a way to reduce employees use of maladaptive emotional regret coping[78] and decreasing the risk of PTSD. Also, strengthening group cohesion and trust would probably increase an openness to sharing experiences following a violent episode, either in formal or informal settings, which could reduce this maladaptive ruminative behavior[78,121].

CONCLUSION

This study is one of the few prospective studies investigating workplace violence and PTSD in a systemic framework including basic work conditions and employees' perceptions and coping within the occupational setting, while also adjusting for a broad spectrum of possible confounders at both the organizational and individual level.

Not only did the study prospectively confirm existing knowledge from cross sectional studies, that frequency of OV is a predictor of PTSD symptoms. It also indicated that frequency of OV is a risk factor for increased time pressure. The study found that the level of PTSD symptoms was predicted by an increase in burnout, a decreasing sense of safety at work and increased maladaptive emotional regret coping, as a result of OV and time pressure. That frequency of OV influenced the development of PTSD symptoms through indirect pathways of non- traumatic but work related factors, underlines the necessity of understanding workplace violence and PTSD within a framework of the employee's perceptions of factors that are specific to work and the organizational setting. First and foremost, based on our findings, there is a need to ensure, that in workplaces where violence is a risk, daily work tempo should be non-paced and steady, not only to reduce general stress and burnout but also to ensure increased sense of safety, better coping strategies and ultimately to reduce risk of work-related PTSD.

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Figure 1: Depicting the conceptual pathways from frequency of violence (Freq. OV) to development of PTSD symptoms (PTSD-symp.). Here depicted directly and indirectly through change of time pressure (ΔTime pressure), change of burnout (Δ Burnout) change in sense of safety at work (Δ SSW) and change in regret coping (Δ RC). All pathways are depicted corresponding to the tested hypothesis (H1-8)

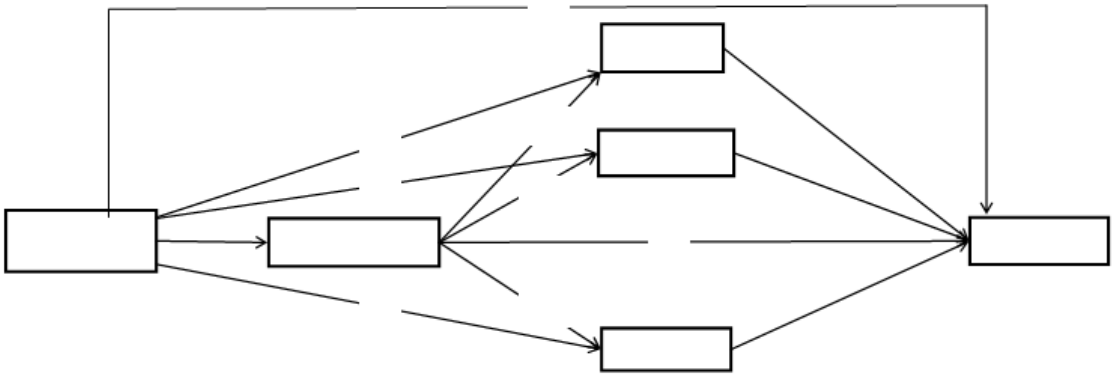


Figure 2: Flow of data collection from baseline (T_1) to 12 months follow-up (T_2) with 12 monthly surveys on exposure to OV(OV $M_{1\text{-}12}$)

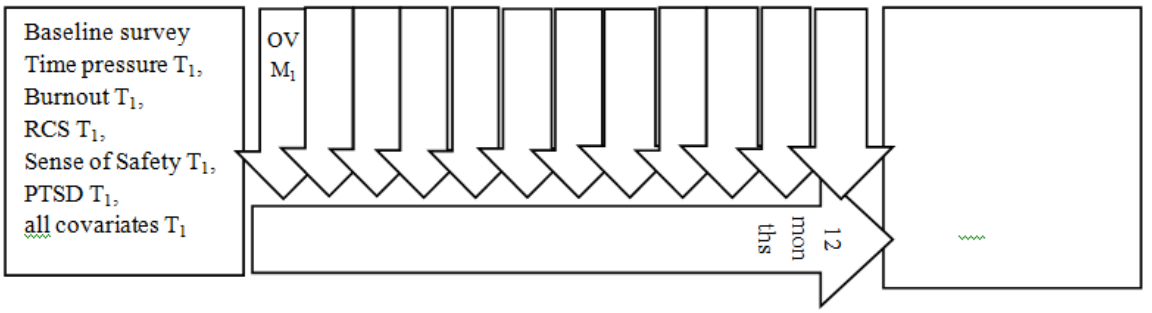
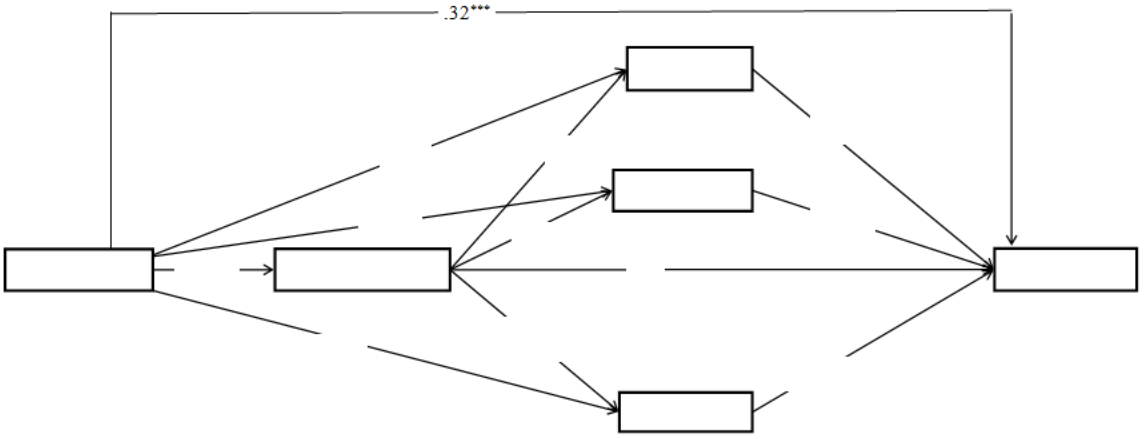


Figure 3: Simple effects of each of the regression paths in the fully adjusted model, presented as regression-coefficients



Note: Adjusted for gender age and baseline value of PTSD, each of the mediator values at baseline as well as critical events within the study period, role-conflict and role-clarity and incidents of severe OV Δ RC e, d, p= change in regret coping e (emotional maladaptive,), d (distancing), p (problem-solving). ΔSSW = change in sense of safety, ΔBurnout = change in burnout. $^{*}p<.05$, $^{**}p<.01$, $^{***}p<.001$

Table 1: simple correlations, number of respondents (N) and mean and standard deviations (SD) of the main variables within the model. (Δ = change)

	1	2	3	4	5	6	7	8	N	Mean	(SD)
1.PTSD symptoms	1								1713	2.56	3.56
2. Frequency of violence	.272**	1							1719	0.78	0.98
3. Δ Time pressure	-.011	.023*	1						1763	-.28	15.20
4.Δ Security at work	-.088**	-.057**	-.098**	1					1763	0.02	0.70
5.Δ Regret coping emo.	.106**	.037	.040*	-.088**	1				1678	0.05	0.55
6.Δ Regret coping prob.	-.081**	-.013	-.030	.078**	-.034	1			1695	-0.01	0.62
7.Δ Regret coping dist.	-.084**	-.014*	-.020	.104**	.223	.284**	1		1695	0.05	0.60
8.Δ Burnout	.169**	.053*	.152**	-154**	.170**	-.111**	-0.72**	1	1726	0.40	3.51

Note: *p<.05, **p<.01

Table 2: Descriptive statistics of the co-variates included. Presented with variable name, Number of respondents (N) mean, Standard Deviation (SD) or percentage.

Variables		**N**	**Percentage / Mean**	**(SD)**
Age			48.7	-9.4
Gender	Male	379	21.50%	
	Female	1384	78.50%	
Smoking	Yes	1267	74.60%	
	No	431	25.40%	
BMI		1677	26.4	-4.9
Alcohol per day		1763	0.96	-0.78
PTSD baseline		1719	2.6	-6.1
Time pressure baseline		1719	53	-17.5
Safety at work baseline		1763	3.24	-0.75
Burnout Baseline		1756	37.7	-16.7
Regret coping baseline	emotional maladaptive	1729	3.1	-2.4
	emotional distancing	1695	5.5	-1.7
	problem solving	1712	5.9	-2
Trauma coping self-efficacy		1662	49.6	-8.2
Lifetime critical events		1762	2.4	-1.9
Critical events during study period		1756	0.6	-1
Incidents of severe violence	Yes	258	14.60%	
	No	1505	85.40%	
Years of experience		1763	17.3	-9.9
Training	Yes	1042	60.20%	
	No	690	39.80%	
Quantitative work demands		1729	48.6	-17.9
Emotional demands		1705	59	-16.8
Role-conflict		1700	45.7	-16
Role-clarity		1725	70.4	-6.9
Workplace social capital Bonding		1715	69.2	-16.9
Workplace social capital linking		1713	65.6	-22.4

Table 3: Simple direct effects within the full serial-parallel mediation model, presented with total variance explained (R^2) and level of significance for the full models (*), further depicting beta-coefficient(β), standard errors (SE), T-statistic (t) and level of significance (p), for the primary predictor and included mediator variables

		Model 1				Model 2				Model 3		
	R^2	β (SE)	t	P	R^2	β (SE)	t	P	R^2	β (SE)	t	P
Model predicting PTSD symptoms	**.35** ***				**.42** ***				**.42** ***			
frequency of OV		.55 (.08)	6.82	<.001		.40 (.08)	4.99	<.001		.32(.08)	3.88	<.001
Δ time pressure		-.00 (.05)	-0.6	0.549		-.00 (.01)	-0.04	0.967		.00(.01)	-0.04	0.97
Δ burnout		.62 (.08)	7.89	<.001		.77 (.08)	8.81	<.001		.75(.09)	8.41	<.001
Δ sense of safety at work		-.15 (.08)	-1.8	0.07		-.40 (.10)	-4.02	<.001		-.40(.10)	-3.94	<.001
Δ regret coping – emotional		.22 (.08)	2.61	0.009		.34 (.08)	3.99	<.001		.37(.09)	4.3	<.001
Δ regret coping - distancing		-.12 (.07)	-1.7	0.094		-.07 (.08)	-0.81	0.419		-.07(.08)	-0.82	0.42
Δ regret coping - problem-solving		-.11 (.07)	-1.43	0.153		-.16 (.08)	-1.85	0.064		-.18(.09)	-2.1	0.04

Note: Model 1 Adjusted for gender age and baseline value of PTSD. Model 2; Also adjusted for baseline values of all mediators. Model 3 Also Adjusted for critical events within the study period, role-conflict and role-clarity and incidents of severe OV.

RCE=Regret Coping Emotional maladaptive. SSW = Sense of safety at work, RCD = Regret Coping Distancing, RCP = Regret Coping Proplemsolving

*p<.05, **p<.01, ***p<.001 all indicating significance of the total simple direct effect models.